

Determinants of Household Participation in Florida's Voluntary Prekindergarten Program
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Abstract

Florida's Voluntary Prekindergarten Program (VPK) has shown tremendous growth, serving about half of the state's 4-year-olds in 2005, its first year of operation, and about 66 percent currently. However, the lack of universal participation raises questions about the extent to which program awareness, socio-economic background, or race and ethnic differences affect participation decision making and raises concerns about equity of access to programs. NIEER investigated the determinants of household awareness of and participation in the VPK program. The research presented seeks to understand how program participation varies due to child and family characteristics. We administered household surveys to random samples of families with VPK-eligible children and estimated the effects of household and provider characteristics on the probability of participation, taking into account differences in awareness across households. We find awareness about the program varied depending on parental education levels. In addition, conditional on awareness, we find that the probability of participation actually declines as income rises — yet increases as mothers' education rises. However, we also find that at a certain point, high educational attainment reduces participation, suggesting that quality may be an important determinant of participation for higher-educated segments of the population. In addition, participation levels turned out to be higher for better-informed Hispanics. While overall Hispanic participation is low, Hispanics with awareness of the program are more likely to participate than their white counterparts.

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Introduction

Florida's Voluntary Prekindergarten (VPK) program, mandated in 2002¹, has been open to all 4-year-olds on a voluntary basis since the 2005-2006 school year. The vast majority of participants attend private child care centers, and most of the rest attend public schools (a very small number enroll in family home day care and private schools). When it became law, VPK set in motion a process of diffusion of information, presenting households with information about the program. Those who learned about it made decisions about whether to participate and if so, whether to enroll in the school year or summer option.

VPK ramped up quickly and served 51 percent (112,684) of the state's 221,000 4-year-olds through public and private providers in 2005-2006, its first year of operation². This rapid program scale-up was followed by continued growth, and by the 2009-2010 program year enrollment had reached 146,710 children³. Florida has a highly diverse population with many parents with low levels of educational attainment, who speak a language other than English or work in low-paying jobs. This paper looks at the extent to which these and other factors such as location within the state affect program participation.

A precise description of the children enrolled is difficult from official records because parents are not required to answer all questions. Responses regarding race and ethnicity are as follows: 38 percent white, 18 percent African American, 23 percent Hispanic, and the rest multiracial, Asian, American Indian, or unknown⁴. It appears that the vast majority of those who do not report race are white non-Hispanic. Parents reported that 15 percent of the children were English Language Learners (ELL), 66 percent non-ELLs, and 19 percent are not reported either way. Enrollment rates in VPK vary considerably by county from between 0-25 percent in counties such as Desoto, Glades, Jefferson, Madison, and Union to 75-100 percent in counties such as Gilchrist, Hernando, Liberty, Okaloosa, Seminole, and Taylor⁵. School-year programs comprise 90 percent of total enrollment⁶.

The variability in participation since the program's inception raises questions about the extent to which program awareness and other variables affect participation as well as concerns about equity of access to programs (Barnett and Yarosz, 2004). This motivated NIEER to investigate determinants of household participation in VPK. This research seeks to understand how program participation varies with child and family characteristics. Household surveys administered to random samples of families with young children enable us to estimate the effects of household and provider characteristics on the probability of participation. We address demand responses in this paper, separately from supply (provider) responses, taking into account characteristics of the aggregate market for early care and education.

We find that some parents are more likely to know about the opportunity to enroll their children in VPK. Less-educated parents are less likely to know about the program and more-educated parents are more likely to know. We find that the probability of participation declines as income rises but it increases as mothers' education rises — up to a point. Once graduate-level degrees are attained, participation declines. Participation is also lower in rural areas and higher for families in which mothers work full time. The probability of VPK participation declines for

larger families. Finally, participation is higher for Hispanics but only after taking into account the probability of knowing about VPK.

Data

In the spring of 2007, NIEER administered a telephone survey to 1,305 parents/legal guardians of children aged 4 and 5 who were randomly selected throughout the state. A clustered random sampling design was used, within six groups of county clusters and stratified by county clusters, ethnicity, and income⁷. Trained interviewers administered a 35-item survey using a computer assisted telephone interview (CATI) system. Respondents were surveyed between the months of March and June of 2007, and interviews were conducted in Spanish and English (about 13 percent in Spanish). Participants were offered a \$10 check mailed to their home address in appreciation for their participation. Incomplete information for some members of the original sample left us with 1,208 families with responses we could analyze for this study.

Our household surveys collected information on the child's current education and care arrangement, family background (ethnicity, parental education, and language), household income, and enrollment in the VPK program. We also used official statistics on the Florida counties where families lived. County child poverty rate and rural, suburban or metropolitan status were extracted from the U.S. Census Bureau (School District Estimates of Poverty⁸ and the 2000 Census, correspondingly), and 2005 average education, employment, and wage information at the county level were extracted from the Quarterly Census of Employment and Wages, U.S. Bureau of Labor Statistics.

For analysis, we weighted the sample to represent the population by race, income (data by cluster), and education (statewide data). Our unweighted/weighted sample appears to slightly over represent VPK participants, as 51 percent reported being enrolled in VPK. That year, 56 percent of the estimated number of 4-year-olds were reported enrolled in the program year (includes the VPK school year and summer programs), with 49 percent being enrolled in February 2007⁹, just before our survey. The surveyed sample is 59 percent white, 21 percent Hispanic, and 15 percent African American. In the final weighted sample 58 percent of children are white, 23 percent Hispanic, and 15 percent African American due to missing data. These percentages are very similar to the state's ethnic/racial composition of 60 percent non-Hispanic white, 21 percent Hispanic, and 16 percent African American in 2007 with very little variations projected for 2010 (Office of Economic and Demographic Research, 2009)¹⁰.

Table 1 summarizes VPK participants and non-participants by selected characteristics. Households that choose to participate in the VPK have on average higher levels of mother's education. Nevertheless, they exhibit lower income levels, and are more likely to have the mother working full-time rather than part-time. On the other hand, VPK participants are more likely to belong to a county with a slightly lower poverty rate (on average 1 percent lower).

Table 1. Summary statistics for selected indicators across non-VPK and VPK weighted households.

Variables	Non-VPK N=596		VPK N=623	
	Mean	SE	Mean	SE
<i>Family Background</i>				
White	0.58	0.02	0.59	0.02
Hispanic	0.23	0.02	0.21	0.02
African American	0.15	0.01	0.15	0.01
Other	0.04	0.01	0.04	0.01
<i>Household size</i>	4.43	0.05	4.12	0.04
<i>Child is Bilingual</i>	0.26	0.02	0.23	0.02
<i>Child has IEP</i>	0.10	0.01	0.03	0.01
<i>Mother's Education</i>				
HS dropout	0.13	0.01	0.11	0.01
HS Graduate	0.27	0.02	0.22	0.02
Associate/Some College	0.18	0.02	0.24	0.02
College	0.29	0.02	0.31	0.02
Graduate	0.13	0.01	0.12	0.01
<i>Income & Work Measures</i>				
<=15000	0.11	0.01	0.13	0.01
>25000 & <=35000	0.06	0.01	0.07	0.01
>35000 & <=50000	0.14	0.01	0.10	0.01
>50000	0.69	0.02	0.70	0.02
Part-time work mother	0.18	0.02	0.16	0.02
Full-time work mother	0.35	0.02	0.49	0.02
<i>Type of care</i>				
Attended PK previous yr	0.57	0.02	0.61	0.02
Public center	0.10	0.01	0.21	0.02
Head Start center	0.04	0.01	0.02	0.01

Children may attend a non-VPK preschool program, and even within VPK, children attend programs under different auspices. Table 2 shows the distribution of participation across auspice by income categories for VPK and non-VPK participants. At higher income levels, participation in public centers drops off significantly for VPK participants. This is not as much the case for non-VPK participants whose participation rates were lower to begin with, and who demonstrate higher levels of Head Start and home or relative care. VPK low-income households also may enroll in private sector programs at a higher rate than their non-VPK counterparts. However, caution is warranted as a large percentage of non-VPK families did not specify the auspice, and this missing information could explain some of the differences as well as the unrealistically low reported enrollment rate for Head Start by low-income non-VPK families.

Table 2. Participation across auspice by income categories for VPK participants and non-participants.

	Income Categories				Total
	<= 25000	25-35000	35-5000	> 50000	
<i>VPK Type</i>	56	53	42	52	51
Public	17	15	12	9	11
Private	32	34	26	39	36
Headstart	3	1	2	1	1
Unspecified	4	3	2	3	3
<i>NVPK Type*</i>	44	47	58	48	49
Public	4	7	2	6	5
Private	9	12	25	21	19
Headstart	3	6	1	1	2
Other	3	4	3	4	4
Unspecified	25	18	27	16	19
Total	100	100	100	100	100

(*)Family day care, day care home, relative & non-relative care in own home, relative's home, before/after school programs.

Note: Weighted tabulations. Survey appears to underestimate Head Start enrollments which we estimated at approximately 9 percent in Florida and 13 percent nationally for 4-year-olds using the National Household Education Surveys (28 percent in the lowest income quintile).

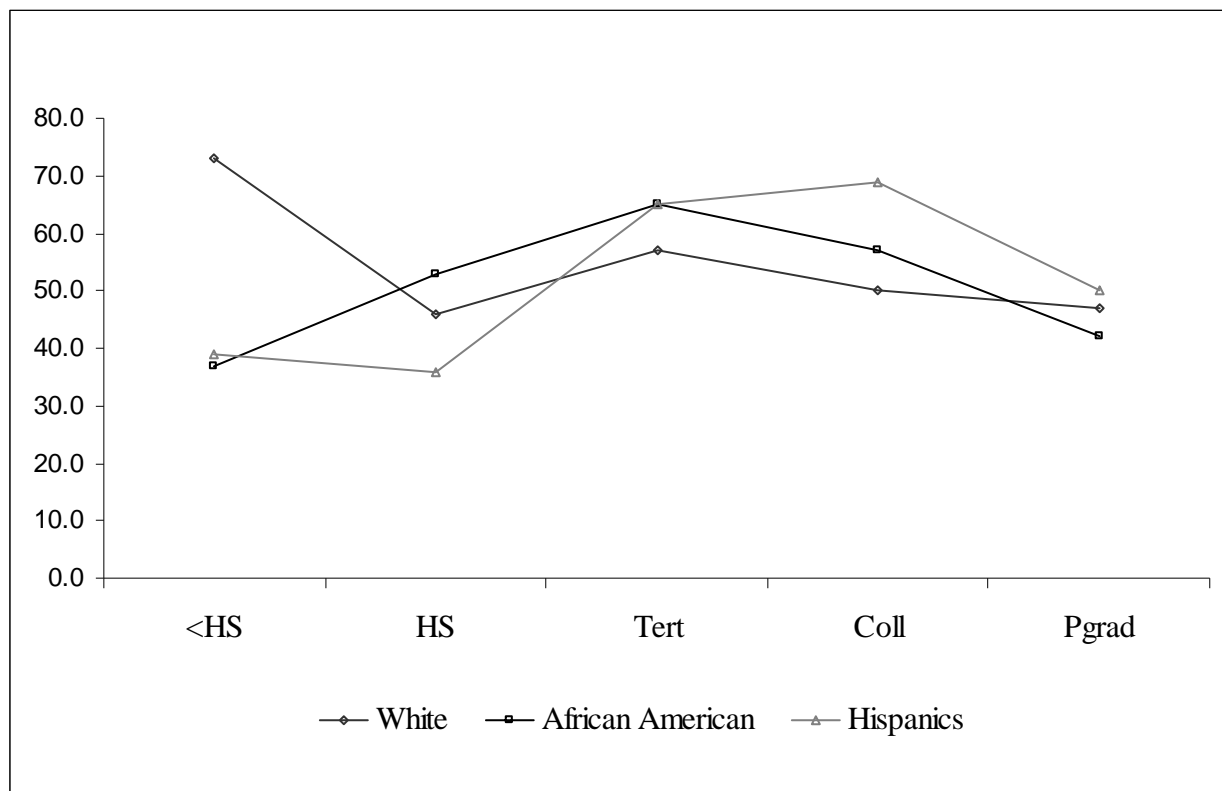
Table 3 reports on (1) participation rates and (2) whether parents knew their child was eligible for VPK by selected population characteristics (education, income, and ethnicity/race). We observe higher participation rates when parents have some education beyond high school. Participation rates are highest for those with lowest incomes, and lowest for families with incomes between \$35,000 and \$50,000, but rise again for families with incomes greater than \$50,000 per year. Hispanic families are less likely to participate. Knowledge of the availability of VPK increases with education across all levels and increases with income up to \$50,000 per year where it levels off. This suggests that participation rates might be raised considerably for poorly educated and low-income families if their awareness of VPK could be raised to the levels of parents who attended college or had incomes above \$35,000 per year. Finally, Hispanics have by far the lowest awareness of the VPK program. If they were as aware of VPK as white non-Hispanics their participation rates might well exceed other groups. Hispanics are only 4 percentage points less likely to participate than white non-Hispanics even though they are 23 percentage points less likely to know about the program.

If we look into the data more deeply we find that VPK participation rates vary differently by education for Hispanics than other ethnic groups. Figure 1 shows the distribution of participation rates by mother's educational attainment and race. Hispanic families have particularly low participation rates at low education levels compared to others who are high school graduates. Patterns across ethnic groups are more similar for more highly educated households, with a large dip in participation observed for Hispanic and white households whose mothers have at most a HS degree, increasing for all ethnic groups with tertiary degrees, and slightly dropping for College degrees except for Hispanics.

Table 3. Participation and Knowledge about the Program within selected population characteristics.

Selected Characteristics	N	Participates (%)	Knows (%)
<i>Mothers Education</i>			
HS dropout	148	46	64
HS Graduate	296	45	74
Associate/Some College	257	59	90
College	363	53	90
Graduate	155	49	92
<i>Income Level</i>			
<25,000	148	56	72
25-35,000	82	54	83
35-50,000	143	42	83
>50,000	846	52	85
<i>Race</i>			
White	717	50	89
Hispanic	269	50	69
African American	179	51	81
Other	54	52	83

Figure 1. Weighted distribution of VPK participation rates by mother's educational attainment and ethnicity.



Some families in VPK also purchase additional hours of preschool or child care on their own. Table 4 reports the use of additional care by VPK-participating households and whether such additional care is from the VPK provider. For the lower income groups and low education groups, the VPK program appears to be the only source of care, while the percentage of

households participating in additional care (and in additional care in the same institution) increases with income and mother's education.

Table 4. Use of additional care for VPK participants, weighted.

Selected Characteristics	N	Add Care (%)	Same Add Care (%)
<i>Mothers Education</i>			
HS dropout	68	9	3
HS Graduate	135	20	12
Associate/Some College	152	16	11
College	193	25	21
Graduate	76	30	25
<i>Income Level</i>			
<25,000	83	15	7
25-35,000	44	25	23
35-50,000	60	23	17
>50,000	437	21	15
<i>Race</i>			
White	370	18	14
Hispanic	134	18	13
African American	92	29	20
Other	28	39	29
<i>Total</i>	<i>624</i>	<i>21</i>	<i>15</i>

Statistical Models of the VPK Participation Decision

When the VPK legislation was passed, this gave momentum to demand and market growth. The law provided households with additional funds to purchase preschool services from child care and education programs. In many cases, they could purchase these services from the same child care providers they would have used any way, and with whom they had perhaps already enrolled their children at age 3. The additional funding could have led them to increase the number of hours per week they obtained from these programs. They also could have chosen different, more expensive providers. Some families are likely to have enrolled their children in centers or schools that would have kept their children home or sent them to informal care in the absence of VPK. We attempt to disentangle for households the determinants of participation in the VPK program by estimating equations that predict the probability of participation.

The VPK, as stated in the program's name, is voluntary. Families choose to participate on the basis of information, preferences, budget restrictions, and available alternatives. Consequently, whether a family chooses to participate depends on family characteristics, including parental income, and the supply of preschool alternatives. Supply variables may affect consumption. For example, in the first year of the VPK (2005-2006), some counties were not allowed to participate because they were not in compliance with class size reduction guidelines. Nevertheless, some households in those counties still participated (they could access providers across county lines) as they valued the opportunity provided by VPK and exercised their choice despite the low local

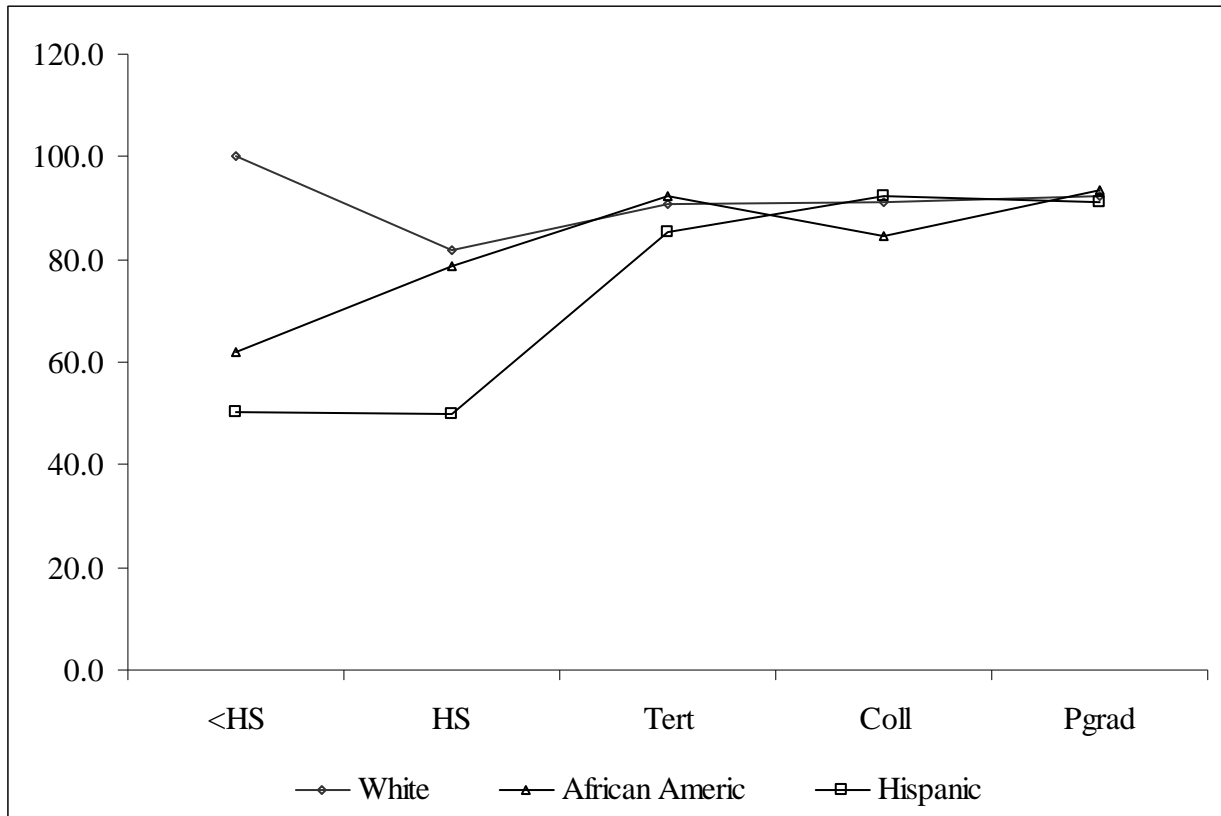
VPK supply. In this instance, motivated parents made use of “choice” even when confronted with restrictions.

In our models of VPK participation, parents’ early education and child care choices are influenced by their preferences, the availability of caregivers within the household, and by their budget constraints, the latter determined by household income. We expect permanent income (expected income over the long-term, which is a function of parental education) and transitory income (wages/ yearly income, which is subject to ups and downs due to, for example, changes in the economy) to have different effects on the propensity to enroll in the VPK. Transitory income is more important when parents cannot borrow to finance preschool care and education. On the other hand, permanent income affects the overall propensity to invest in more and better quality education over a lifetime (see Glewwe and Jacoby, 1994).

We investigated the decision to participate in the VPK program for the 2006-2007 academic year using two different approaches (see Appendix I for detailed methodology). In the first approach we estimated the probability that families know about VPK and the probability that they enroll a child in the program separately (see Appendix II for these estimations). In the second, we jointly estimated the two, with the VPK participation decision conditional on knowledge of the program. The second approach provides our preferred estimates, and makes intuitive sense. Families cannot choose to enroll in VPK if they do not know it exists and they are eligible. However, it may also be the case that families who are more interested in enrolling their children in a preschool program, particularly one for which there is public funding, may more actively seek out that information. Therefore, we obtain the separate estimates of interest as well. This model is formulated in Appendix I.

As can be seen in Figure 2, knowledge of VPK varies by level of mothers’ educational attainment, and the effects of education differ by ethnicity. If the mother has some education beyond a high school diploma, knowledge of VPK is uniformly high regardless of ethnicity. For mothers with only a high school diploma, knowledge of VPK is sharply lower among Hispanics, but not whites or African-Americans. For mothers who are high school dropouts, knowledge of VPK is sharply lower for Hispanics and African-Americans, but not whites. However, our sample size is quite small for high school dropouts. These data indicate that access to VPK information varies systematically based on family background characteristics that might also be thought to influence the decision to participate in VPK *per se*, reinforcing the notion that it is important to try to separate out influences on knowledge of VPK from influences on the choice to participate (keeping in mind that the supply of programs available, or access, may influence both, as well).

Figure 2. Weighted percentage of parents/guardians who report they knew about VPK by mother’s education and ethnicity.



Results

Family background characteristics and other factors influence VPK participation in two ways. First, they affect whether parents know about VPK. Second, once parents know that VPK is available, they affect whether parents enroll their children. Table 5 presents our best estimates of the simultaneous effects on knowledge and participation.

A number of parent characteristics significantly affect whether or not parents know about VPK. Better-educated parents are more likely to know about VPK. Bilingual families are less likely to know about the program than monolingual families in the first place. Ethnicity has no effect on knowledge of VPK, but if bilingualism in the home had not been included in the analysis, Hispanic families would be seen as less likely to know about VPK. Families with a child who has a disability as indicated by an Individualized Education Plan (IEP) formulated with the public schools are less likely to know about the program. Mothers who work part-time are less likely to know. If the child attended a preschool program at age 3, parents are more likely to know about VPK. Finally, parents are more likely to know about VPK if they live in counties with a higher child poverty rate and where the district cost differential (which corrects for costs of living) is higher.

Conditioning participation on knowledge of the program yields mostly small effects on participation (also Table 5). Given that families know about VPK, education plays a role in participation only for parents who have education beyond a BA degree; these parents are less likely to enroll a child in VPK. Families with incomes above \$25,000 per year are less likely to participate. After controlling for knowledge on the program, Hispanics are more likely to participate than white non-Hispanics. The probability of participating in VPK is negatively associated with having an IEP. Also, having negative effects on participation are household size and living in a rural area. We also ran independent estimations for the participation probability and the information probability (presented in Appendix II). We noted that selection through information reduces an observed effect of maternal education on the independent estimation of the probability of participation and that income effects are sustained and even larger than in independent estimations. That is, if we did not take into account that knowing about the program informs one's choices, and that knowing about the program is strongly defined by education, income and race, we would have concluded that participation was defined mostly by education and less so by income. However, once this is taken into account, we find the inverse outcome.

Table 5. Household's Bivariate Probit w/measures of VPK supply and quality and interactions.

VARIABLES	knows	participates	knows	participates	knows	participates
Attended pre-K previous yr	0.225* (0.136)		0.134 (0.138)		0.140 (0.144)	
Hispanic	-0.162 (0.272)	0.310* (0.164)	-0.168 (0.182)	0.322* (0.180)	-0.181 (0.174)	0.320* (0.179)
African American	-0.166 (0.166)	0.188 (0.161)	-0.216 (0.133)	0.172 (0.161)	-0.202 (0.146)	0.170 (0.170)
Other	-0.133 (0.115)	0.041 (0.154)	-0.129 (0.103)	0.062 (0.155)	-0.142 (0.108)	0.059 (0.160)
Bilingual	-0.449** (0.183)	0.149* (0.084)	-0.462*** (0.134)	0.189 (0.117)	-0.450*** (0.139)	0.187 (0.120)
Mother HS Graduate	0.020 (0.242)	-0.220 (0.198)	-0.012 (0.271)	-0.171 (0.229)	-0.007 (0.277)	-0.175 (0.244)
Mother AA / Some College	0.648*** (0.113)	-0.147 (0.210)	0.600*** (0.143)	-0.186 (0.164)	0.604*** (0.143)	-0.183 (0.168)
Mother College	0.573** (0.246)	-0.319 (0.265)	0.521* (0.292)	-0.350 (0.239)	0.518* (0.298)	-0.348 (0.241)
Mother Graduate	0.760** (0.379)	-0.513** (0.250)	0.677* (0.390)	-0.555** (0.260)	0.679* (0.394)	-0.553** (0.263)
>25,000&<=35,000	0.137 (0.150)	-0.344 (0.233)	0.128 (0.157)	-0.348 (0.264)	0.134 (0.156)	-0.347 (0.260)
>35,000&<=50,000	0.162 (0.246)	-0.581** (0.236)	0.208 (0.222)	-0.557** (0.245)	0.200 (0.234)	-0.557** (0.240)
>50,000	-0.057 (0.144)	-0.335** (0.143)	-0.050 (0.131)	-0.310** (0.143)	-0.053 (0.140)	-0.310** (0.144)
IEP	-0.561** (0.262)	-0.574** (0.237)	-0.601** (0.250)	-0.452* (0.234)	-0.595** (0.246)	-0.472* (0.246)
Household size		-0.187*** (0.021)		-0.158*** (0.034)		-0.159*** (0.035)
Suburban	0.204 (0.198)	0.273* (0.165)	0.239 (0.217)	0.246 (0.161)	0.230 (0.231)	0.253 (0.162)

Rural	0.235 (0.280)	-0.854*** (0.221)	0.101 (0.230)	-0.754*** (0.203)	0.094 (0.259)	-0.761*** (0.203)
County poor, ages 5-17 (%)	-0.056*** (0.013)	-0.021 (0.016)	-0.056*** (0.012)	-0.014 (0.019)	-0.056*** (0.012)	-0.015 (0.021)
District Cost Differential	0.658 (2.207)	3.113* (1.613)	0.852 (1.850)	2.599* (1.441)	0.846 (1.908)	2.667* (1.468)
Mother Part-time work			0.251* (0.150)	-0.062 (0.146)	0.251 (0.153)	-0.061 (0.144)
Mother Full-time work			0.516*** (0.130)	0.097 (0.162)	0.511*** (0.128)	0.102 (0.156)
Head Start					-0.233 (0.399)	0.009 (0.323)
Observations	1,219	1,219	1,219	1,219	1,219	1,219

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Mothers working part-time are less likely to know about the program, yet conditional on knowing about the program, they are not more likely to participate. As work decisions might be having complex effects on whether parents learn about VPK and are interested in participating, we estimated alternative models that condition participation on the work decision (see Appendix II for details). In these alternatives, VPK participation among Hispanic and African American families is more likely than white non-Hispanics, taking into account their decisions about full-time employment.

Discussion & Conclusion

When Florida launched the VPK program, it set in motion a process of diffusion of information, and presented households with the task of finding out about the program and deciding whether to participate. Many chose to do so. From its inception, VPK experienced a large uptake (Barnett, Epstein, Friedman, Boyd and Hustedt, 2008). Nevertheless, there are important variations in VPK participation across the state. This study attempts to shed light on the determinants of participation in the VPK program. This is a more difficult task than simply identifying who participates and who does not, because the decision to participate depends on whether one knows about VPK in the first place and on other decisions such as parental employment and work schedules that may be made jointly with the decision to enroll a child in VPK. Overall, our findings show that having information about the program is fundamental, and separating out this issue leads to a better understanding of who participates and why. Households respond as they learn about the existence of VPK. It also shows that having such information is related to many of the important household characteristics that ultimately affect the participation decision.

Access to information does appear to play an important role in who participates in VPK. Parents who are less educated, part-time working mothers, families who did not enroll their child in a preschool program at age 3, and bilingual families were less likely to know about VPK. This suggests increased targeted outreach would provide these parents with information about the VPK program.

Parents with the highest levels of education and families with higher incomes were more likely not to participate. This suggests that some families likely may not participate because they are seeking higher-quality options and they have more alternatives. Further investigation about why they choose not to participate seems warranted.

Lower participation rates by rural households could be due to a lower supply of VPK (or other preschool options) in rural areas. The U.S. Department of Health and Human Services (Swenson, 2006) reports that center care arrangements for children aged 0 to 5 were available to 44 percent of families in rural areas versus 55 percent of families in urban areas in 2005 based on the National Household Education Survey. It would be useful to consider how the VPK program might expand access for rural families.

Finally, children with IEPs are less likely to know about VPK, and even if their families know about the program, are less likely to participate. This suggests that special education professionals working with families and the families themselves do not consider VPK a viable option for many children with disabilities. As VPK provides opportunities for educating children in mainstream environments, this seems unfortunate. Again, further research into the reasons behind this would be useful. Are there concerns about educational quality and the ability of VPK to provide appropriate services? Is there a lack of personnel who can deliver special education services in VPK? Could more be done to integrate preschool education and VPK services?

Overall, it appears that enrollment in VPK by lower-income and less-educated households is affected by their access to information about VPK. Therefore, it is important to attend to the role of information when seeking to expand access to public programs such as VPK and when studying variations in participation rates within the population. Information can be viewed as an asset that defines the effective participation opportunities of families and lack of information can limit the choices families make. Efforts to make information better available to low-income and less-educated families can make an important contribution to access by the most disadvantaged families. Access and enrollment for higher-income and better-educated groups seem to be quite different and may relate to issues of VPK quality. This suggests that it may be useful to study both the quality of VPK classrooms and the perceptions of parents from different economic and educational backgrounds of that quality and the quality of the alternatives that they can access.

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Appendix I: Model Estimation

We estimate the determinants of the probability of participation of families in the VPK program for the 2006-2007 school year (using maximum likelihood methods) as the following equation¹¹:

$$\Pr(VPK_i = 1 | X_i = x_i) = \Phi(x_i' \beta) \quad (1)$$

where,

Φ = Cumulative distribution function of a standard normal distribution

VPK_i = Participation in the program

x_i = Family characteristics and VPK supply characteristics

β = Parameters

Measuring participation in VPK without taking into account that some families could not choose to participate simply because they did not know of the program (which is in itself not a random process, as information, and time, are both resources) would likely affect the estimates on participation, as the group that “learns” about the program might be “selective”. That is, children from higher socio-economic and parental education backgrounds may in actuality evidence larger participation effects. This could be induced by access to information, rather than actual revealed choices¹². The observed participating sample would then fail to represent the whole school age population and analyses based on it can lead to wrong policy conclusions, particularly if the long-term goal is for everyone to have a choice of participation, and choices require information¹³.

Figure 2 on page 9 illustrates how knowledge of VPK varies with mothers’ educational attainment and across race. Higher education levels are related to higher levels of information rates for all race/ethnic groups, with lower mother education levels showing significant information differences across groups, with a particularly low incidence of information for Hispanics. This provides some evidence that access to information is not random and might therefore be acting as a selection mechanism in terms of who actually participates and who does not.

The selection problem can be thought of as a problem of missing observations: We do not know whether families that did not know about the program would have chosen to participate had they known about the program’s existence and their eligibility. Consequently, “knowing” and “participating” may not be independent of each other. We need to take this selection into account when estimating participation in the program. Thus, we complement the previous analyses by predicting VPK participation conditional on the probability of households knowing about the program. We identify knowing about the program as depending on the other determinants of participation (family background, location), as well as on lagged attendance to preschool, and supply characteristics defined by county level capacity in a system. As an alternative to equation (I) we estimate the probability of VPK enrollment, having corrected for selection on whether the household knew about the program, using a system of simultaneous equations. In this model, VPK enrollment is an observed binary variable for which there is an underlying latent variable that depends on the distribution of the function of knowledge about the program.

Therefore, we estimate by maximum likelihood methods (bivariate probit with sample selection) the probability of participation in VPK as:

$$\Pr(VPK_i = 1) = \Pr(VPK_i \cap I_i = 1) \quad (2)$$

where,

VPK_i = Participation in the program

I_i = Information about the program

$$VPK_i = 1, \text{ if } y_{i1} > 0; VPK_i = 0, \text{ otherwise} \quad (3)$$

$$I_i = 1, \text{ if } y_{i2} > 0; I_i = 0, \text{ otherwise} \quad (4)$$

$$y_{i1} = x_{i1}\beta_1 + \varepsilon_{i1} \quad (5)$$

$$y_{i2} = x_{i2}\beta_2 + \varepsilon_{i2} \quad (6)$$

The participation probability assuming bivariate normal distributions for the errors in (5) and (6), and $Cov(\varepsilon_{i1}, \varepsilon_{i2}) = \rho$ would be estimated as:

$$\Pr(VPK_i = 1 \cap I_i = 1) = \Phi(x'_{i1} \beta_1, x'_{i2} \beta_2, \rho) \quad (7)$$

where,

Φ = Cumulative distribution function of a standard normal distribution

x_i = Family characteristics, VPK supply characteristics, lagged preschool attendance

β = Parameters

ρ = Error correlation

We estimate equation (7), presented in the results section, together with the information probability, independently. These are presented in Appendix II. These allow comparing how participation and information equations in the selection estimation differ from the independent estimations.

Appendix II. Additional Estimations.

Table i presents estimates for influences on households' VPK knowledge or participation rates. The first sets of estimates measure the impacts of household characteristics on the likelihood that parents know about VPK. The second set of estimates is for the probability of participation in the VPK independent of knowledge about the program.

Parents are more likely to know about the program if the child attended preschool in previous years, the mother works full-time, has some education beyond a high school diploma, and lives in counties with lower percentages of children in poverty. On the other hand, bilingual families are less likely to know about the program.

Annual parental income affects the likelihood of participation in VPK, but not of knowledge of the program. In particular, parents with incomes above \$35,000 are less likely to participate in the program than poorer parents¹⁴. The probability of participation is increased in households where the mother works full time. Because we are controlling for community-level characteristics (described below) differences observed are more likely due to income disparities across families than across communities¹⁵.

Mothers' education is expected to have several effects on participation in VPK. As already noted, better-educated mothers are more likely to know about VPK, other things being equal. With greater knowledge of the program comes greater opportunity to enroll. In addition, mothers with higher levels of education may have attached more importance to formal education and be more likely to enroll a child in VPK for that reason; however, very high levels of maternal education could indicate a preference for more intensive, higher quality education than VPK offers. Finally, mother's education is also an indicator of permanent income, and families anticipating higher levels of income across a lifetime can be expected to spend more on a young child's education than others, even controlling for current income (Jacoby & Skoufias, 2002). We find that mothers with some college education are more likely than others to enroll children in VPK, and that there are no significant differences among those with either lower or higher levels of education. This suggests that as a variable, maternal education has an "n" shape wherein households with increasing levels of education have the tools, resources, or background to take advantage of the VPK but households with very high levels of education are likely to prefer alternative (likely higher quality) choices to VPK.¹⁶

Compared to whites, being Hispanic, African American, or from any other race does not appear to have a statistically significant effect on the probability of participation. Similarly, bilingual households do not have a significantly different probability of participation. On the other hand, households where children required Individualized Educational Plans (IEPs) have a much lower probability of participation. This may reflect the difficulty of adequately delivering IEP services within VPK. IEP children would more likely benefit in a program that would provide more hours. In comparison to urban counties, households in rural counties are significantly less likely to enroll their children. Larger households are less likely to enroll children in VPK, suggesting this is related to making care arrangements within the households.

Introducing measures of part-time or full-time work into the model might introduce a source of endogeneity. The decision to work or not, or whether to work part-time versus full-time might occur in relation to knowledge of the costs and opportunities for child care and preschool. This could work various ways. Mothers might choose to work in order to afford preschool and/or care, or they might work only if they can afford to pay for preschool, i.e., their wage rate is equal to or higher than the hourly preschool and/or care rate¹⁷. Although we cannot detect a correlation (in comparison to non-working mothers) between part-time work and the probability of the decision to participate in VPK, we do observe a positive correlation for full-time work for both the knowing and participating.

While various community-level variables were analyzed for their potential influence on VPK participation, only the poverty rate at the county level evidenced a systematic effect. Families in poverty had a lower probability of participating. Analyzing district cost differentials, a factor used in funding to reflect variation in the cost of living among districts, showed no effect on the probability of VPK participation even though these differentials are used to determine school funding.

Given the differences on the incidence of access to information by race and maternal education levels shown in Figure 2, Table i estimates the probabilities for the total sample and Hispanic households to observe whether the determinants of the probabilities of having information on the program and participating in the VPK varied for this group. For Hispanics we observe much stronger effects of increased education levels on the probability of both knowledge of and participation in the program. For the overall population, education does not strongly affect the probability of participation, but among Hispanics there is a higher likelihood of participating if the mothers have education beyond even a high school diploma or are college graduates. Hispanic families with incomes of \$25,000 to \$35,000 also had a higher probability of participation. When Head Start participation was analyzed, Hispanics showed a lower probability of knowledge of and participation in VPK, which is consistent with low incomes required to qualify for Head Start. These findings point to heterogeneous responses and determinants across population groups.

Table i. Households' Probit on Knowledge and Participation on VPK (marginal effects).

Variables	Total Sample		Hispanics	
	knows	participates	knows	participates
Attended pre-K previous yr	0.028 (0.033)	0.007 (0.028)	0.044 (0.098)	0.045 (0.085)
Hispanic	-0.057 (0.056)	0.032 (0.041)		
African American	-0.049 (0.043)	0.016 (0.056)		
Other	-0.045* (0.025)	-0.027 (0.054)		
Bilingual	-0.104*** (0.040)	-0.037 (0.036)	-0.128*** (0.038)	0.044** (0.022)
Mother HS Graduate	-0.004 (0.063)	-0.030 (0.074)	-0.090 (0.104)	-0.108* (0.060)
Mother AA / Some College	0.105***	0.114**	0.235***	0.231***

	(0.022)	(0.053)	(0.053)	(0.050)
Mother College	0.094*	0.034	0.283***	0.224***
	(0.053)	(0.063)	(0.065)	(0.068)
Mother Graduate	0.108**	-0.016	0.254***	0.079
	(0.046)	(0.062)	(0.089)	(0.136)
25-35,000	0.026	-0.054	0.161**	0.233***
	(0.038)	(0.087)	(0.068)	(0.059)
35-50,000	0.039	-0.121**	-0.041	-0.152
	(0.044)	(0.061)	(0.105)	(0.104)
>50,000	-0.005	-0.080	0.007	-0.055
	(0.037)	(0.056)	(0.043)	(0.048)
IEP	-0.171**	-0.294***	-0.251***	-0.093
	(0.082)	(0.087)	(0.068)	(0.099)
Household size	-0.000	-0.054***	-0.010	-0.066**
	(0.007)	(0.010)	(0.014)	(0.032)
Mother Part-time work	0.044	0.036	0.040	-0.059
	(0.030)	(0.052)	(0.158)	(0.185)
Mother Full-time work	0.101***	0.151***	0.123	0.093***
	(0.032)	(0.030)	(0.091)	(0.025)
Head Start	-0.070	-0.058	-0.356***	-0.327***
	(0.107)	(0.067)	(0.123)	(0.076)
Suburban	0.031	0.118**	-0.168	0.018
	(0.039)	(0.054)	(0.134)	(0.074)
Rural	0.018	-0.261***		
	(0.069)	(0.069)		
County poor, ages 5-17 (%)	-0.011***	-0.017**	-0.001	-0.017*
	(0.003)	(0.008)	(0.012)	(0.009)
District Cost Differential	0.320	1.171*	1.573	0.293
	(0.375)	(0.666)	(2.013)	(1.524)
Observations	1,217	1,217	311	311

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

If low-income and bilingual households are less likely to know about the program in the first place, it follows that this affects their participation rates. For households belonging to these groups, actually knowing about the program amplifies the importance of low-income versus high-income differences on the propensity to participate. One way to delve into whether ‘selection by information’ is guiding our results by income is to use estimates that take into account the selection processes of having information about the program to be able to make the decision to participate. These leverage on variables that have an effect on the long-term propensity for enrollment in preschool but are not related to current market conditions, such as lagging preschool attendance.

Table ii presents simultaneous estimates of variables relating to VPK and the decision to participate. The probability of having information about the program (first step equation) is positively affected by maternal education, the county child poverty rate and district cost differential (which corrects for costs of living) and negatively affected by the need for IEP and part-time work by mothers. Bilingualism also matters in terms of knowing about the program.

Bilingual families are less likely to know about the program than monolingual families in the first place.

Selection through information yields mostly small effects on participation (also Table ii). When knowledge of the program exists, the effect of mother's education on participation disappears. Income effects are sustained and larger than in independent estimations. We also observe that the probability of participating in the program is negatively affected by IEP status of the child, household size, if a household is rural, and part-time work of mothers. Interestingly, after controlling for selection on information, Hispanic households evidence significantly stronger positive participation rates relative to whites (the omitted group). Overall, the models predicted correctly the probability of participating for 63 percent of the cases.

Table ii. Households' Bivariate Probit w/ measures of VPK supply and quality and interactions.

VARIABLES	Knows	Participates	Knows	Participates
Attended pre-K previous yr	0.225* (0.136)		0.140 (0.144)	
Hispanic	-0.162 (0.272)	0.310* (0.164)	-0.181 (0.174)	0.320* (0.179)
African American	-0.166 (0.166)	0.188 (0.161)	-0.202 (0.146)	0.170 (0.170)
Other	-0.133 (0.115)	0.041 (0.154)	-0.142 (0.108)	0.059 (0.160)
Bilingual	-0.449** (0.183)	0.149* (0.084)	-0.450*** (0.139)	0.187 (0.120)
Mother HS Graduate	0.020 (0.242)	-0.220 (0.198)	-0.007 (0.277)	-0.175 (0.244)
Mother AA / Some College	0.648*** (0.113)	-0.147 (0.210)	0.604*** (0.143)	-0.183 (0.168)
Mother College	0.573** (0.246)	-0.319 (0.265)	0.518* (0.298)	-0.348 (0.241)
Mother Graduate	0.760** (0.379)	-0.513** (0.250)	0.679* (0.394)	-0.553** (0.263)
>25,000&<=35,000	0.137 (0.150)	-0.344 (0.233)	0.134 (0.156)	-0.347 (0.260)
>35,000&<=50,000	0.162 (0.246)	-0.581** (0.236)	0.200 (0.234)	-0.557** (0.240)
>50,000	-0.057 (0.144)	-0.335** (0.143)	-0.053 (0.140)	-0.310** (0.144)
IEP	-0.561** (0.262)	-0.574** (0.237)	-0.595** (0.246)	-0.472* (0.246)
Household size		-0.187*** (0.021)		-0.159*** (0.035)
Suburban	0.204 (0.198)	0.273* (0.165)	0.230 (0.231)	0.253 (0.162)
Rural	0.235 (0.280)	-0.854*** (0.221)	0.094 (0.259)	-0.761*** (0.203)
County poor, ages 5-17 (%)	-0.056*** (0.013)	-0.021 (0.016)	-0.056*** (0.012)	-0.015 (0.021)

District Cost Differential	0.658 (2.207)	3.113* (1.613)	0.846 (1.908)	2.667* (1.468)
Mother Part-time work			0.251 (0.153)	-0.061 (0.144)
Mother Full-time work			0.511*** (0.128)	0.102 (0.156)
Head Start			-0.233 (0.399)	0.009 (0.323)
Observations	1,219	1,219	1,219	1,219

Robust standard errors in parentheses,*** p<0.01, ** p<0.05, * p<0.1

It is worth noting that mothers working part-time are less likely to know about the program, yet conditional on knowing about the program, they are not more likely to participate. There might be an endogenous decision to go from part-time to full-time work status that reduces participation of part-time working mothers. Consequently, we tested for endogeneity in work status for mothers and program participation through maximum likelihood estimates (MLE).

To do so, we used county level data on educational attainment (percentage of the population having attained different education levels) versus employment and wage data¹⁸. By using a bivariate approach that corrects for the endogeneity of the full-time work mother's decision (bivariate probit with partial observability), we were able to see consistent and increased effects (and slightly increased standard errors) for education, income, IEP, household size, and living in rural areas (Table iii). While county levels of educational attainment and wage information did not show any effects in the full-time work status of mothers, county employment levels and district cost differentials appear correlated with the probability of being employed full time. Significantly, VPK participation equations show a higher propensity for Hispanic and African American households to participate conditional on the probability of full-time employment.

Table iii. Bivariate probits accounting for mother's work endogenous decision.

VARIABLES	Full-Time	Participates	Full-Time	Participates
Percent HS attainment			0.030 (0.039)	
Percent Some College			-0.006 (0.021)	
Percent College attainment			0.023 (0.023)	
Average Wage	-0.020 (0.113)		-0.039 (0.173)	
Average Employment	0.000 (0.000)		0.000 (0.000)	
County poor, ages 5-17 (%)	-0.005 (0.017)		0.001 (0.028)	
District Cost Differential	-4.033* (2.137)		-5.900*** (1.995)	
Attended pre-K previous yr		0.028 (0.069)		0.033 (0.071)
Hispanic	0.243	0.060	0.250**	0.057

	(0.149)	(0.060)	(0.127)	(0.060)
African American	0.412***	0.058	0.432***	0.070
	(0.049)	(0.115)	(0.060)	(0.120)
Other	0.235	-0.057	0.225	-0.062
	(0.209)	(0.097)	(0.210)	(0.098)
Bilingual	-0.130	-0.116	-0.127	-0.113
	(0.096)	(0.109)	(0.097)	(0.108)
Mother HS Graduate	0.259	-0.068	0.263	-0.060
	(0.243)	(0.202)	(0.248)	(0.199)
Mother AA / Some College	0.319	0.308**	0.309	0.312**
	(0.325)	(0.132)	(0.338)	(0.128)
Mother College	0.413	0.130	0.403	0.131
	(0.318)	(0.170)	(0.326)	(0.169)
Mother Graduate	0.492	0.050	0.481	0.053
	(0.303)	(0.155)	(0.315)	(0.154)
Income>25000 & <=35000	0.081	-0.100	0.098	-0.097
	(0.230)	(0.193)	(0.238)	(0.191)
Income>35000 & <=50000	-0.329***	-0.312**	-0.328***	-0.315**
	(0.118)	(0.155)	(0.117)	(0.157)
Income>50,000	-0.120	-0.161	-0.119	-0.165
	(0.104)	(0.144)	(0.105)	(0.147)
IEP	0.314*	-0.749***	0.321*	-0.741***
	(0.164)	(0.273)	(0.170)	(0.271)
Household size	-0.181***	-0.163***	-0.180***	-0.162***
	(0.038)	(0.024)	(0.042)	(0.024)
Suburban	-0.088	-0.200	-0.137	-0.200
	(0.209)	(0.230)	(0.278)	(0.226)
Rural	-0.028	-1.409***	-0.172	-1.414***
	(0.314)	(0.054)	(0.450)	(0.060)
Head Start			-0.291	-0.222
			(0.370)	(0.175)
Observations	1,217	1,217	1,217	1,217

Robust standard errors in parentheses, ***p<0.01,**p<0.05,*p<0.1

¹ House Bill 1A was passed in 2004 to implement the VPK.

² Technical Assistance Paper # 07-02: 2004-05 and 2005-06 School District Participation and Impact of Voluntary Prekindergarten (VPK) Program. Florida: Office of Learning, Florida Department of Education.

³ VPK Fact Sheet January 2010, Implementing Florida's Voluntary (VPK) Education Program. (2009) Florida: Office of Early Learning, Florida Department of Education. <http://www.fldoe.org/earlyLearning/pdf/vpk-factsheet.pdf>

⁴ Students served by the VPK but that were not matched against Department of Education demographic data.

⁵ Voluntary Prekindergarten Education Program: An Update - FLDOE Home. (2009). Florida: Office of Learning, Florida Department of Education. <http://www.fldoe.org/eias/databaseworkshop/word/vpk.rtf>

⁶ Final 2006-07 VPK Provider Kindergarten Readiness Rates: Setting Minimum Rate. February 19, 2008. Florida: Florida Department of Education, State Board of Education.

⁷ Florida's 67 counties were grouped into 6 clusters: i) Bay, Calhoun, Escambia, Franklin, Gadsen, Gulf, Holmes, Jackson, Jefferson, Leon, Liberty, Madison, Okaloosa, Santa Rosa, Taylor, Wakulla, Walton, and Washington; ii) Alachua, Baker, Bradford, Clay, Columbia, Dixie, Duval, Gilchrist, Hamilton, Layfayette, Levy, Nassau, Saint Johns, Suwanee, and Union; iii) Brevard, Citrus, Flagler, Lake, Marion, Orange, Osceola, Putnam, Seminole, Sumter,

and Volusia; iv) Hernando, Hillsborough, Manatee, Pasco, Pinellas, Polk, and Sarasota; v) Broward, Indian River, Martin, Okeechobee, Palm Beach, and Saint Lucie; vi) Charlotte, Collier, DeSoto, Glades, Hardee, Hendry, Highlands, Lee, Miami-Dade and Monroe.

⁸ U.S. Census Bureau, http://www.census.gov/hhes/www/saipa/downloads/sd05/sd05_FL.txt

⁹ Office of Economic and Demographic Research. (March, 2007) VPK Estimating Conference Report. Florida: The Florida Legislature.

http://edr.state.fl.us/Archives2007/Summer/Conferences/VPK%20Estimating%20Conference%20values_7-25-07.xls

¹⁰ Office of Economic and Demographic Research. Florida total population by race, gender, and Hispanic Origin: April 1 1970-2030. (Date last updated: November 3, 2009). Florida: The Florida Legislature.

¹¹ Given the small sample size and cluster sampling design of the survey, we prefer probit to logit models within the family of generalized linear models (Hanh and Soyer, 2005).

¹² Alternatively, it could move in networks and therefore could depend on cultural and social capital (Bourdieu, 1986), which would increase with parental income but could also be clustered within race. However, we are not focusing on networks and cultural capital in this analysis.

¹³ This is similar to what Cameron and Heckman (1998; 2001) define as a selective survival of the “fittest”, when estimating transition probabilities (the probability of transitioning from one level to the next) which lead to an overstatement of the estimated effect of observables, such as family background, income. In this scenario, “surviving” would be reciprocal to “having information”. There are much larger differences in education between those who do and do not know about the VPK program’s availability than there are between those who do and do not participate.

¹⁴ We performed Wald tests among income level coefficients: the different levels are not statistically different from each other.

¹⁵ A one way ANOVA for counties showed that 8.12% of the total variance in VPK household participation is between-community variance and 91.88% of the total variance occurs within counties ($Rho=0.035$).

¹⁶ We performed Wald tests for the statistical difference of coefficients: *mothed3* (tertiary) is the only coefficient statistically different from the rest.

¹⁷ There is no mother work requirement or income requirements to qualify for the VPK as there are in some early care state programs.

¹⁸ Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW). Department of Labor.