The Economic Value of Early Education for Arizona

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Summary

High-quality early education boosts child development and helps Arizona families become economically secure. Without child care, many parents cannot fully participate in the labor market: family incomes are lower; and career prospects are restricted. In turn, economic activity across Arizona is impacted.

This Report calculates the full economic burden of inadequate child care in Arizona. Applying an economic model to a state-wide survey of 306 parents with children aged under 5, the economic consequences are derived for working families in Arizona, for local businesses, and for taxpayers across the state.

Most Arizona families rely for child care on a patchwork of multiple arrangements, including family care, non-family care, pre-school and other informal carers. However, parents are clear: they want affordable, high quality, and accessible care. Unfortunately, across Arizona, few families have this care:

- Affordability is a challenge for 62%
- Quality is a challenge for 47%
- Access is a challenge for 70%

Inadequate early education options affect the economic security and work options of parents. Looking over their recent experiences and since their child was born, Arizona families experience many labor market penalties:

- **Effort at work:** 3-in-5 report that early education problems have caused them to be distracted, late, or missed commitments at work.
- **Hours of work:** More than 1-in-3 report that the hours they can work are restricted because of inadequate early education. These restrictions are reduced hours, changed schedules, or going part-time.
- **Job exits:** 1-in-5 have experienced a significant work disruption as a result of inadequate early education. These disruptions include quitting, being demoted, or being fired.
- **Career opportunities:** More than 1-in-3 report that inadequate early education has curtailed their career options. Parents are less likely to get training, accept new job offers or promotions; and they are more likely to adjust their job to match their child care needs.

These labor market penalties are large and persist over multiple years; they hold for all groups, including minority families and those with low household incomes.

The economic consequences for Arizona parents, businesses, and taxpayers of inadequate preschool are identifiable using an economic model of labor supply, business output and the state tax code.

Each year, per Arizona parent with children aged under 5 there are substantial annual losses:

- **Parents lose $6,320** from lower earnings, reduced productivity at work, and from job search expenses.
- **Businesses lose $2,020** in reduced revenue and in extra recruitment costs.
- **Taxpayers lose $1,530** in lower federal and state/local taxes.

Economic losses are even greater across the childhood years from birth to kindergarten:

- Parents lose $18,510 in lost earnings, reduced participation in the labor market, and in lower returns to experience.
- Businesses lose $4,950 per worker in reduced revenue and in extra recruitment costs.
- Taxpayers lose $4,580 per working parent in federal and state/local tax.

Aggregated across all 474,000 parents **in Arizona the annual income losses total $2,996 million**, $958 million in business output, and $725 million in tax revenue.

Significant commitment to public funding of early care and education would offset much of these losses and would boost economic activity across the state.

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1 Introduction

Early child care boosts child development.[1] It also increases family incomes by allowing parents to participate in the labor market.[2] With high-quality and sufficient child care, parents can then find jobs, be more productive at work, and build successful careers. Early education therefore serves as a dual policy for children and their parents.

Arizona has over 392,000 children aged under 5; many of these children are in families that do not have access to high quality or affordable child care. Approximately half of all families in Arizona live in a child care "desert"; rates are even higher for low-income and minoritized families.[3] These families therefore rely on a patchwork of child care options. By ages 3 to 4, only 15-20% of children in Arizona have access to publicly-funded pre-school programs.[4] Both these early care and pre-school shortfalls are longstanding; but they were exacerbated by the COVID-19 pandemic (as the price of child care places rose and the supply fell).[5] This struggle to obtain child care impinges on Arizona families' ability to work.

In this Report, we calculate the economic burden of inadequate child care and (early education) for Arizona. Using new survey data from Arizona parents, we identify the strong relationship between child care options and parental labor market participation. We then calculate the economic burden – in terms of lost earnings and job separations – when early education is inadequate. The burden is calculated for Arizona families and businesses and for the Arizona economy. Overall, we find significant burdens such that improving early education options would generate large economic returns for Arizona.

2 Survey of Parents in Arizona

This analysis uses survey of 306 working parents across Arizona. The sampling frame is parents with young children aged under 5 as of September 2023. (Appendix 1 describes the survey design).

The survey respondents are representative of parents with young children across

Arizona. (Frequencies are shown in Appendix Table 1A). Racial groupings are similar; as is the regional distribution. Female respondents are disproportionately represented; therefore, for aggregate analysis across all parents the results are re-weighted by gender. Potential estimation biases are examined in sensitivity testing.

The work status of the survey respondents aligns with that of the Arizona workforce. (Frequencies are shown in Appendix Table 1B). Parents are younger and have less work experience than the state-wide average; these differences are captured in the survey. The sample has lower full-time employment rates and modestly higher unemployment. Hours worked per week are almost identical to the state average. Weekly earnings are slightly lower ($906 versus $1,104 state-wide); hourly earnings and average household income are also correspondingly lower (at $28 versus $32; and $62,490 versus $73,450).

Broadly, the survey represents the characteristics and the work patterns of parents with young children across Arizona.

3 Childcare in Arizona

Most families in Arizona have limited access to public child care programs.[6] The result is a patchwork of early education, as parents attempt to combine work needs with family responsibilities.[7]

Table 1: Early Education: Participation

	All Arizona Parents	Hispanic Afr. American	Low Household Income
Type of care used (%):			
Family child care at home	37	28	23
Home care by non-family	34	41	41
Center-based child care facility	34	27	31
Multiple/informal arrangements	40	43	37
Employer support for child care (%):			
Program on-site	15	10	6
Financial support	11	8	6
Arrangements with off-site care	14	6	4

Source: Zogby Survey, September 2023. *Notes: N*=306, 120, 81. For type of care, respondents gave multiple responses. Parents of children aged under 5. Low income: <$30,000.

Table 1 shows how Arizona parents rely on early education. As of September 2023, more than one-third of Arizona parents relied on family child care at home.[8] Another one-third rely on home care by outside carers (relatives, nannies); and another one-third have access to a center-based child care facility. Notably, four-in-ten parents describe their child's early education as informal or based on multiple arrangements. Most of this early education is not paid for by public funds.

In addition, families receive limited support from their employers. Fewer than one-in-seven families have access to either an on-site child care program, or financial support, or arrangements with off-site care. Even as employers recognize the benefits of early education, many are unable to provide support for their workers. As a result, families are not able to fund child care through their workplaces.

Table 2: Early Education: Challenges

	Arizona Parents All	**Hispanic Afr. American**	**Low Household Income**
Parents who report significant challenges			
in accessing early education (%):			
Affordable	62	61	57
High quality	47	38	31
Accessible [a]	70	64	64
Convenient location	43	40	33
Matches work-week schedule	31	32	32
Open slots	31	32	38
Flexible to work shifts	38	27	27
Finding emergency care	30	28	29
Finding special needs care	7	9	9

Notes: [a] Accessible includes affirmative responses to at least one of six listed categories. Child care is any nonparental care for children aged under 5. All parents. *N*=306, 120, 81.

The struggle to find adequate early education is reflected in parental views about their options. Table 2 reports on the challenges parents face. Almost two-thirds of Arizona parents declare that there are significant challenges in finding early education that is affordable (62%). One-half say that finding a quality option is a challenge. Importantly, seven-in-ten parents report challenges in accessing early

education. Notably, almost half link access problems to their work schedules and shifts.[9]

Evidence is also shown for two disadvantaged groups: minority (Hispanic and African American) families and families with incomes below the federal poverty line.[10] (These results are based on sub-samples of 120 and 81 respondents respectively; the estimates are therefore less precise). As shown in Table 1, there are similar patterns of care for these two groups as for the state-wide pattern. Notably, there is heavy reliance on multiple/informal care (and less opportunity for family care at home). But there is a clear difference in terms of employer support: disadvantaged families have jobs that are less likely to offer on-site or off-site programs or any financial support for early education. Table 2 shows similar concerns for all groups of parents regarding affordability, quality and access.

Together, these results paint a clear picture: families in Arizona do not have early education that allows them to fully participate in the labor market.

4 Early Education and Work

Inadequate early education causes working families to suffer in terms of: work productivity and effort; hours of work; job security; and career opportunities. These work-related adversities are reflected in many different aspects of these parents' jobs. The aggregate result is a significant economic burden per family.[11]

Table 3 shows the many ways in which inadequate early education impacts on parents in the labor market. Parents are asked about work-related issues over the last three months and since their child was born. Thus, immediate and long-term problems are identifiable.

Table 3: Early Education and Work-Related Problems

Work-related issues because of problems with early education	**Arizona Parents All**	**Hispanic Afr. American**	**Low Household Income**
Over past 3 months:			
Productivity:			

Distracted to point of being unproductive	59	57	48
Effort:			
Missed a full-day of work	63	65	54
Left work earlier than normal	61	59	57
Been late for work	59	58	49
Missed work shift	41	40	31
Since child (aged under 5) was born/adopted:			
Hours:			
Reduced your hours	42	46	49
Changed work schedule	36	30	26
Had pay/hours reduced by employer	32	36	39
Changed from full-time to part-time work	31	35	42
Termination:			
Quit a job	28	36	37
Reprimanded by supervisor	32	33	27
Been let go or fired	19	23	22
Demoted	17	21	21
Career:			
Turned down opportunity for further education	39	47	38
Turned down new job offer	38	48	26
Found a new job compatible with child care	37	40	32
Had problems getting work-related training	30	33	26
Turned down promotion or reassignment	25	24	23

Source: Zogby poll, May 2023. Parents not in work excluded. *Notes:* N-306, 120, 81. Parents indicated at least these issues at least one time.

Over the past three months, more than half (59%) of Arizona parents report “being distracted to the point of being unproductive at work” as a result of inadequate early education. Many working parents report missing a full day of work (61%), leaving work early (61%), being late for work (59%), or missing a work shift (41%).

Thus, inadequate early education constraints the effort families can put in to their jobs.

Over the years since their child was born, parents report even more disruptions; these are shown in the lower panels of Table 3. The disruptions are varied for parents:

- Hours of work are significantly disrupted: 42% reduced their hours; and 36% report a changed work schedule
- Job terminations and demotions are frequent: 28% report quitting a job; 19% report being fired; and 17% report being demoted
- Career trajectories are substantially constrained: 39% turned down further education; and 37% found a new job compatible with their child care needs

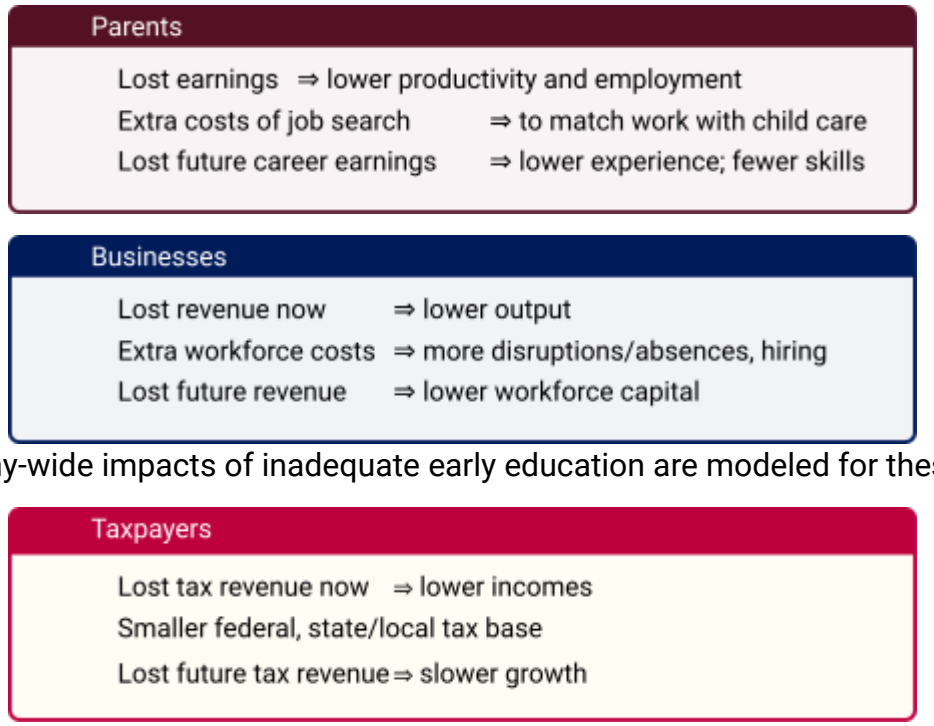
Disadvantaged parents experience greater disruptions as a result of inadequate early education. Whereas productivity, effort, and hours are similar across all parents. But disadvantaged parents are more likely to experience the most damaging consequences: minority parents and low-income parents report higher rates of job quits, being let go, and being demoted. For minority parents, career prospects are also disproportionately impaired.

Table 3 emphasizes the multi-faceted and persistent adversities of inadequate early education for working parents.[12] Given these adversities, it is possible to calculate the economic burden of inadequate early education.

5 Inadequate Early Education: Economic Model

The burden of inadequate education can be calculated via its effects on family earnings and labor market costs. These effects generate secondary burdens on businesses and the local economy and its tax base. The full set of burdens are described in Box B1.

B1. Economic Burdens of Inadequate Early Education



Economy-wide impacts of inadequate early education are modeled for these three groups – workers, firms, and taxpayers. The model applies the survey results to earnings profiles for parents, as well as state-level data on business activity and tax rates.[13] All figures are reported in 2023 present value dollars. (The full method is given in Appendix 2.)

For working families the burdens are lost earnings from lower productivity, missed work hours, job terminations, and diminished career prospects. Also, working families incur monetary losses in time spent on job search. For firms and businesses, the losses arise because the workforce has lower productivity and more displacement. (Firms can adjust workers' pay partially but not instantaneously/perfectly; and firms would prefer productive workers who will not quit their jobs (or incur hiring costs).) Over time, the workforce is not optimally trained and has less experience. Finally, taxpayers obtain lower tax revenues at both federal and state/local level.[14] Each year of reduced economic activity therefore leads to a corresponding loss in general tax revenue.

The economic consequences are reported as annual amounts per parent with any children aged under 5 and per parent across the child's birth to kindergarten years (and beyond). Model estimates are derived as the average per parent — not the

amount per parent who is adversely impacted. Amounts are then aggregated across the parents of the 392,000 young children. For annual burdens, aggregate losses are for all 474,000 working parents in 2023. The childhood burdens are reported for each annual cohort of 94,000 parents whose children were born in 2023.[15]

6 Inadequate Early Education: Economic Burden

Annual Burdens

Each year when their child is aged under 5, parents face economic burdens. These annual burdens persist as long as early education is inadequate or the labor market adjusts to support working parents. (Currently, there is no immediate change in policy to provide support for thousands of young children). In this model the burdens are reported as averages per parent (not averages per burdened parent). Some parents experience no burden; but, as shown in Table 3, many parents experience various burdens, including job termination.

Table 4: Inadequate Early Education: Annual Loss

Arizona	**Annual Loss per Parent (child aged under 5)**
Parents:	
Lost earnings	*$4,950*
Extra cost of job search	*$1,370*
Total	*$6,320*
Businesses:	
Hiring/staff costs	$990
Lost revenue	$1030
Total	*$2,020*
Taxpayers:	
Lost federal tax	$940
Lost state tax	$590
Total	*$1,530*

Sources: Author calculations from Table 3, Appendix 2. *Notes:* 2023 dollars.

Annual losses are economically significant across Arizona parents. These losses are shown in Table 4:

- Losses per parent amount to $6,320 per year. Most of the burden is lost hourly wages and fewer work hours; terminations are also economically significant. The burden of job search is also significant.
- Losses to business amount to $2,020 per year for each parental worker. This burden comes from: reduced revenue; lower productivity (not offset by lower wages); and extra hiring costs.
- Total taxpayer revenues are reduced by $1,530 per year. Lower incomes lead directly to lower income tax contributions and indirectly to lower consumption taxes paid.

These direct economic losses occur every year that a child is aged under 5.

Burdens over Childhood

From the family perspective, the annual burdens happen every year until the child is eligible for kindergarten. The burden for each year depends on the availability of early education and on prior labor market decisions; families can adjust to their circumstances to alleviate some burdens. However, burdens can accumulate because parents have less work experience and fewer skill development, making it harder to find work. Thus, the full childhood burden is not the annual burden times five. Instead, the burden has three age waves: age 0-2, when the family is looking for child care; age 3-4, when the family is looking for pre-school; and age (5-7), when the child is entering kindergarten but the parents are still experiencing job disruptions.

Childhood burdens are shown in Table 5 from the perspective of a child born in Arizona in 2023. Expressed as a lump sum at birth, working parents face a total economic loss of $18,510 from inadequate early education (ages 0-4). Most of the burden is for child is ages 0-2; but there are persistent effects at ages 3-4 because of limited pre-school opportunities in Arizona. As the child enters kindergarten, parents are still adjusting to their diminished career options; this adjustment is

estimated to last three years (ages 5-7). These lagged burdens are shown in the last column of Table 5. The total childhood burden increases to $23,780 for parents; burdens for businesses and taxpayers are also modestly greater.

Table 5: Inadequate Early Education: Childhood Loss

	Loss per Parent	
Arizona	**Childhood 0-5**	**Childhood 0-7**
Parents	$18,510	$23,780
Businesses	$4,950	$5,110
Taxpayers	$4,580	$5,830

Sources: Author calculations from Tables 3-4, Appendix 2. *Notes:* [a] Present value at birth; discount rate 3%.

Businesses face a total economic loss of $4,950. This lump sum covers the period when the worker's child is under school age. Relative to the annual burden, this burden decays rapidly because of job turnover and because firms adjust wages and work allocations over time to match workers' productivity. Finally, total tax losses for Arizona are $4,580 across the childhood. These losses arise every year the parent experiences labor market penalties.

Aggregate Losses from Inadequate Child Care

There are 474,000 parents with children aged under 5 in Arizona. As shown in Table 6, the aggregate impact of inadequate education across all these parents is substantial. For context, these burdens can be compared to the Arizona state government budget, which is $31 billion, and to the Arizona GDP, which is $430 billion.[16]

Table 6: Aggregate Loss: Inadequate Early Education

Arizona	**All Parents with Children 0-4 Annual Loss**	**Parents of Birth Cohort 2023 Childhood Loss**
Parents	$2,995.7 m	$1,739.9 m
Businesses	$957.5 m	$465.3 m
Taxpayers	$725.2 m	$430.5 m

Sources: Author calculations from Tables 3-4, Appendix 2. *Notes:* [a] Present value at birth up to age 5; discount rate 3%.

Annual burdens are economically substantial: · $2,996 million for parents (≈0.5% of GDP); $958 million for businesses; and · $725 million for taxpayers (≈2% of tax revenue).

Burdens for each birth cohort over childhood are also large. (A birth cohort is all children born in 2023 with the expectation that child care and pre-school options remain the same during their entire childhood). Conservative results are reported, assuming no impact once the child enters kindergarten. These lump sum burdens are: · $1,740 million for parents; · $465 million for businesses; and · $431 million for taxpayers. These estimates establish how the burdens compound each year and the cumulative burden of the system over multiple years.

7 Robustness Checks

Sensitivity Testing

The above results can be checked using sensitivity tests. Two testing methods are applied here.

First, review of the model results indicates that they are unlikely to be reduced under alternative assumptions. The model estimates reported in Tables 4, 5 and 6 are based on conservative assumptions. Specifically, the model estimates cannot account for preemptive decisions by parents to reduce their work commitments because they expect pres-chool will be inadequate. When parents expect their future work opportunities to be constrained, they will invest less in career-building skills. As well, only parental impacts are modeled: relatives and informal carers may incur economic burdens when pre-school is inadequate. Finally, managerial and operational costs from lost productivity are not considered (because of data availability). Given these factors, the full burdens are likely to be much more than reported here.

Table 7: Economic Loss: Monte Carlo Simulations

	Loss per Parent			
	Mean	**SD**	**Min.**	**Max.**
Annual Loss (child aged under 5):				
Parents	$6,310	$1,170	$2,610	$11,130
Businesses	$2,020	$360	$850	$3,610
Taxpayers	$1,550	$290	$620	$2,780
Total Loss (over childhood):				
Parents	$18,550	$1,440	$13,660	$24,150
Businesses	$4,940	$410	$3,490	$6,570
Taxpayers	$4,610	$360	$3,390	$6,010

Notes: Monte Carlo simulation with 10,000 iterations. Mean estimates as per Tables 4-5. Distributions for earnings, quit rate, hours penalty, and wage penalty as per Appendix Table A2.

A second approach is to apply Monte Carlo sensitivity testing. Specifically, 10,000 simulations are run based on the distributions of key variables (reported in Appendix Tables 1B and 2). These key variables are individual earnings, the job/quit rate, and months unemployed.

The sensitivity testing results are reported in Table 7. (The mean values correspond to those in Tables 4 and 5.) For annual losses, the standard deviation is $1,170 and the minimum estimated burden is $2,610 — these are clearly above zero. (Potentially, the burdens could be as high as $11,130).

Similarly, the annual loss for businesses and for taxpayers are significantly above zero. Looking at the total loss over childhood, the standard deviation of the estimated loss for parents is narrow (at $1,440) with a range of $13,660–$24,150. Business and taxpayer losses over the same period are also large. Overall, simulation results are bounded ±15% around the mean estimates from Tables 4 and 5 and all scenarios yield burdens that are significantly above zero.

Results for Disadvantaged Groups

Family circumstances affect early education options and how those options impinge on parental work.[17] Minority and low-income families may be doubly

disadvantaged. They may have a harder time finding child care; Table 1 provides some modest support for this. Also, these families are more likely to have "precarious" jobs where child care inadequacies matter more; Table 3 does show higher termination rates for disadvantaged parents.

Overall, the impact of inadequate early education is (modestly) greater for disadvantaged groups than for the state-wide sample. However, the earnings of these groups are substantially lower than the state-wide average. For minority groups, average earnings are $760, i.e. 16% below the Arizona average of $906. Similarly, average earnings of persons in low-income families are $560, i.e. 38% below the Arizona average. These earnings gaps mean that the absolute level of the burden of inadequate early education is lower for these groups. Given these earnings disparities, the burdens per parent are smaller in absolute terms to the state-level average. With lower incomes, the minority families *de facto* experience smaller economic burdens. However, the *relative* burdens they face – based on the greater challenges – are higher than the state-wide average.

8 Conclusions

Arizona parents struggle to balance early childhood education with the need to work. Early care is limited and less than one-fifth of children can access public pre-school programs. The majority of parents report challenges in terms of affordability, access and quality. Directly, parents tie these challenges to work-related disruptions to productivity, effort, and careers.

The economic burden of inadequate early education is substantial. For parents, it is approximately 10% of annual earnings. Burdens to businesses and taxpayers are also large. Given these economic burdens – as well as the lost opportunities for child development – there is a compelling case for additional investment in early education across Arizona.

9 Appendix 1: Sampling

Zogby Analytics was commissioned by Ready Nation to conduct an online survey of 306 parents of children under 5 across Arizona in September 2023.

Using internal and trusted interactive partner resources, thousands of adults were randomly invited to participate in this interactive survey. Each invitation is password coded and secure so that one respondent can only access the survey one time.

Using information based on census data, voter registration figures, CIA fact books and exit polls, complex weighting techniques are devised to best represent the demographics of the population being surveyed. Weighted variables may include age, race, gender, region, party, education, and religion.

Based on a confidence interval of 95%, the margin of error for 306 is ±5.6 percentage points. This means that all other things being equal, the identical survey repeated will have results within the margin of error 95 times out of 100.

Subsets of the data have a larger margin of error than the whole data set. As a rule very small subsets of the data (especially sets smaller than 50-75 respondents) are not valid. At that subset of estimations the data is more qualitative than quantitative. Also, additional factors can create error, such as question wording and question order.

Appendix Tables 1A and 1B show the descriptive frequencies for the sample and descriptive frequencies for all employed population with young children across Arizona. Based on comparison of the survey with the state population, the survey appears to be generally representative of the target population with respect to race, location, and individual/family income (accounting for age and gender).

Appendix Table 1A Individual Characteristics

	Survey Sample	Arizona
	(%)	(%)
Race:		
White	61	55
Hispanic	30	33
African American	6	5
Other	3	7
Education:		
HS diploma (or below)	26	34
Some college	27	25
Associate degree	12	7
Bachelor's degree+	34	34
Age:[a]		
18-24	10	19
25-29	20	18
30-34	28	18
35-39	21	17
40+	21	28
Gender:		
Male	37	50
Female	63	50
Family status:		
Single parent	37	36
Married	54	48
Region:		
Maricopa	63	61
Pima county	17	14
Rest of state	20	25
Observations	*306*	*7.276 million*

Sources: Census census.gov/quickfacts/AZ, March Current Population Survey 2022 census.gov/data/tables/2021/demo/families/cps-2022.html. 2021 data, series HC01EST from fred.stlouis.org. Single parent household rate from series S1101PHOUSE039035 at fred.stlouis.org. *Notes:* Survey sample is Arizona parents/guardians of children currently aged under 5. [a] Ages under 65. Census data is parents with co-resident children under age 6 (or 18) or age-adjusted.

Appendix Table 1B Labor Market Involvement

	Survey Sample	Arizona (State)
Employment status (%):		
Working full-time	73	76
Working part-time	14	11
Unemployed	12	4
In school/college	7	9
Hours worked per week	34(11)	33
Income:		
Individual usual weekly earnings	$906 (470)	$1,104
Individual usual hourly earnings	$28 (14)	$32
Average household income	$62,490 (36380)	$73,450
Observations	*306*	*3.157 million*

Sources: Census, March Current Population Survey 2022; Bureau of Labor Statistics; fred.stlouisfed.org; Semega and Kollar (2022). Income data from bls.gov/ regions//countyemploymentandwages_arizona.htm; series from fred.stlouis. org. U.S. Bureau of Labor Statistics and Federal Reserve Bank of St. Louis, Average Hourly Earnings of All Employees: Total Private in Arizona [SMU04000000500000003], retrieved from FRED, Federal Reserve Bank of St. Louis; fred.stlouisfed.org, November 15, 2023. Observation count of Arizona workforce (2023 data, series SMU391 retrieved from fred.stlouis.org). *Notes:* Standard deviations in brackets. All survey responses included (regardless of work status); missing values excluded. Median household income for state. Arizona data for September 2023.

10 Appendix 2: Economic Model

A static, limited-horizon economic model is used to calculate economic burdens of inadequate child care up to age 5. Three perspectives are adopted for Arizona: families; businesses; and the aggregate economy.

Model estimates are derived per working parent (not per *affected* working parent) per year and over childhood years up to school entry. Immediate consequences are annual amounts when a child is any age under 5 (expected value 2). These calculations are then aggregated across the Arizona population of working parents with children under 5 (plus three years post-entry). Childhood estimates are modeled per birth cohort (e.g., children born in 2023) up to kindergarten entry. Aggregated estimates are annual and per birth cohort in Arizona.

The model is populated by combining the survey data results and state-level economic data from the Census and Bureau of Labor Statistics. All figures are in 2023 present value dollars with a discount rate ρ=3%. Appendix Table 2 itemizes model variables, parameter values, and the formulae for calculating economic burdens.

Earnings and Output Losses:

- For i individuals, baseline income y_b is adjusted to y_c with a set of parameters capturing labor market distortions caused by child care and preschool problems β. These distortions are: job quit/exit rates q; and months unemployed m (weighted across all parents and regression-adjusted for age, experience (linear and quadratic), education, and gender). These distortions are subject to a wage penalty v proportionate to the size of the distortion. Individuals incur a dynamic proportion ϵ of these lost hours and lost earnings; (1 − ϵ) is incurred by firms. Workers incur all job search costs as a % of y_b, adjusted for the job quit/exit rate.
- Output losses are the sum of: the dynamic proportion (1-ϵ) of lost hours and lost earnings borne by the employer (1 − ϵ)hw ; and direct employment on-costs z and hiring costs d payable by the firm. These costs are a function of the quit/exit rate and the months unemployed.

(Managerial costs attributable to low worker performance are not included.)

Federal Income Tax Revenue and State/Local Tax Revenue:

- Losses in federal income tax are derived from values for yc multiplied by marginal federal tax rates of 15%.
- State/local income and non-income (consumption/sales and property) tax rates are applied. Arizona state income tax rates are 2.59-4.5%, with deductions of $12,550-$25,000 (taxadmin.org/assets/docs/Research/Rates/ind_inc.pdf). Including sales, property and corporation tax, the state/local tax burden is 9.5% (taxfoundation.org/state/arizona/).
- Federal taxes paid by Arizona residents pass back to Arizona at $\eta = 0.95$. Conservative estimate from rockinst.org/--/fiscal-analysis/balance-of-payments-portal/.

Future Incomes, Output, and Income Tax Revenue:

- Future economic consequences are extrapolations proportionate to the immediate losses to individuals and businesses. Future losses are modeled up to age 5 (i.e., they are assumed to be fully alleviated as children enter kindergarten). For children aged over 3, (some) access to preschool offsets the economic penalties, so a decay rate per penalty is derived (τ per annum, ages 3-4) and (τ^2 per annum, ages 5-7).
- Each working parent experiences 5+3 years of disrupted work patterns from birth.
- Lower skills and less experience per worker are derived as proportionate annuities based on published estimates of the returns to experience and the returns to education/training. These annuities are lost for workers who experience child care problems and are assumed to decay at rate λ to zero after three years post school entry.

Appendix Table 2: Model Variables and Parameters

	Variable/parameter	Value
y_b	Baseline individual earnings p.a. (full/part-time adj.)	$44,820
q	Job quit/exit rate p.a.	0.022
m	Months unemployed p.a.	0.42
j	Job search costs (% of *yb*)	0.084
v	Wage penalty (% of *yb*)	0.0188
η_t	Annual growth rate earnings	0.015
ϵ	Proportion of earnings loss incurred by worker	0.92
z	On-costs	0.1990
d	Hiring costs (% of *yb*)	0.28
r	Federal tax rate	0.15
s_y	State/local income tax rate [a]	0.095
s_s	State/local non-income tax rate (net exemptions) [a]	0.026
η	Federal–Arizona tax pass-through	0.95
ρ	Discount rate	0.03
y_e	Earnings with inadequate child care p.a.	$y_b (1 - v - qm/12)$
g	Tax base	$y_b - y_e$

Notes/Sources: y_b , q – survey data, working parents. m – [www.bls.gov]. v – survey data, regression coefficients. ηt – Carneiro et al. (2011). ϵ – by assumption. z – includes paid leave (7.1%), in paid leave, supplemental pay (3%), health insurance (8.8%) [www.bls.gov/-news.release/ecec. nr0.htm]. d – Boushey and Glynn (2012); Work Institute (2017). r – Saez and Zucman (2019). s_i – for income tax, no dividend tax or exemptions; state/local sales taxes adjusted for tax-exempt consumption [taxpolicycenter.org]. [a] Tax rate from taxfoundation.org/publications/state-local-tax-burden-rankings/#burdens/ohio. ρ – Moore et al. (2013). η –rockinst.org/ issue-areas/fiscal-analysis/balance-of-payments-portal/. Parameters adjusted for non-work status as per Appendix Table 1.

Notes

1. Evidence on developmental advantages includes Reynolds et al. (2011); Heckman et al. (2013); Lipsey et al. (2015); Yoshikawa et al. (2016); van Huizen and Plantenga (2018).

2. Labor market evidence is from Cascio (2018); Belfield (2019); Ruppanner et al. (2019); Borowsky et al. (2022); Gurrentz (2021). For calibrated economic models and labor supply studies see Ho and Pavoni (2020); Moschini (2023).

3. A child care desert is a census tract with >50 children under age 5 that has no child care providers or so few options that there are > 3 as many children as licensed child care slots (childcaredeserts.org/--/index.html?state=AZ).

4. These include Head Start, or designated Special Education programs nieer.org/--/2023/05/Arizona_YB2022.pdf. A review for Arizona is at firstthingsfirst.org.

5. On the increased burden between 2018 and 2023, see Council for a Strong America (2023).

6. On Arizona Child Care Development Funds, see *Annual Report 2023* [p.20], firstthingfirst.org.

7. These results for Arizona are similar to those found in other states. National Household Education Survey estimates are similar (Corcoran and Steinley, 2017). Other survey analyses also show the mixed patterns of care (buildthefoundation.org/--/Early-Education-in-the-Time-of-COVID-19_Final-1.pdf). The COVID-29 pandemic did play a role in reducing early education options. Places for young children fell sharply; and re-opening centers had significantly higher costs (Barnett et al., 2020). With home-based work, preschool became a “juggling act for working parents” (Heggeness, 2020). As the pandemic has abated into 2023, the preschool “system” is recovering; but the damage has been significant. Moreover, early education in Arizona was not widely available before the pandemic.

8. This proportion does not include parents who are not active in the labor market.

9. These results are similar to other state-wide and national studies (Montes and Halterman, 2011; Belfield, 2018, 2019).

10. The federal poverty line is $30,000 for a family of four (www.healthcare.gov/--/federal-poverty-level-fpl/).

11. Again, these effects are similar to those found in recent studies for individuals states (North Carolina, Pennsylvania, and Tennessee) and in national studies (see Montes and Halterman (2011); Davis et al. (2017); Talbert et al. (2018); Belfield (2018, 2019)).

12. These penalties do not count the parents who are not active in the labor market and who therefore experience the largest barriers to work. These parents are approximately 4% of all parents (www.bls.gov/news.release/pdf/famee.pdf).

13. This approach is used in prior studies (Davis et al., 2017; Talbert et al., 2018;

Goldberg et al., 2018; Belfield, 2018, 2019).

14. Arizona state income tax rates are 2.59-4.5%, with deductions of $12,550-$25,000 (taxadmin.org/--/ind_inc.pdf). Including sales, property and corporation tax, the state/local tax burden is 9.5% (taxfoundation.org/state/arizona/). The tax pass-through rate is conservatively estimated at 95%; i.e., almost all federal revenues are remitted back within Arizona. Federal tax rates are from Saez and Zucman (2019). See Appendix 2 for variable/parameters.

15. The population of working parents depends on number of children in the family, number of parents in the family, and labor force participation rates. This population fluctuates over time depending on demographics and labor market conditions. This estimate of 474,000 is calculated as follows. There are 392,000 children aged under 5 in Arizona (data.census.gov). This number is: (1) uprated (by 1.82) to get parents (adjusting for single parents); (2) downrated (by 0.80) to homes with multiple children aged 0-5 (household size and formation data from www.pewresearch.org/--/1-the-american-family-today/); and (3) downrated (by 0.83) to working parents (fred.stlouisfed.org).

16. State budget amount includes the General Fund and Appropriated and Non-Appropriated Funding. State budget data from azospb.gov/2022-budget.html; azeconcenter.org/state-budget-101/. GDP from fred.stlouisfed.org/series/AZNQGSP (2022).

17. Flood et al. (2022) describe in detail how child care varies by parental education and socio-economic status.

References

Barnett, W. S., Jung, K., and Nores, M. (2020). Young children's home learning and preschool participation experiences during the pandemic. Technical report, NIEER, www.nieer.org.

Belfield, C. R. (2018). The economic impacts of insufficient child care on working families. Report, Council for a Strong America, at strongnation.org.

Belfield, C. R. (2019). The economic impacts of insufficient child care for Pennsylvania. Report, Pennsylvania Early Learning Commission.

Borowsky, J., Brown, J. H., Davis, E. E., Gibbs, C., Herbst, C. M., Sojourner, A., Tekin, E., and Wiswall, M. J. (2022). An equilibrium model of the impact of increased public investment in early childhood education. Working Paper 30140, National Bureau of Economic Research.

Boushey, H. and Glynn, S. (2012). There are significant business costs to replacing employees. Report, American Progress, at cdn.americanprogress.org.

Carneiro, P., Heckman, J. J., and Vytlacil, E. J. (2011). Estimating marginal returns to education. *American Economic Review*, 101(6):2754–2781.

Cascio, E. U. (2018). Why early childhood education matters and why we should pay for it. Monograph, milkenreview.org.

Corcoran, L. and Steinley, K. (2017). *Early Childhood Program Participation, from the National Household Education Surveys Program of 2016*. National Center for Education Statistics, Institute of Education Sciences, U.S. Dept. of Education, Washington, DC.

Davis, B., Bustamente, A., Bronfin, M., and Rahim, M. C. (2017). Losing ground: How child care impacts Louisiana's workforce productivity and the state economy.

Flood, S., McMurry, J., Sojourner, A., and Wiswall, M. (2022). Inequality in early care experienced by us children. *Journal of Economic Perspectives*, 36(2):199–222.

Council for a Strong America, C. (2023). *$122 billion: The growing, annual cost of the infant-toddler child care crisis*. Technical report, Ready Nation, Council for a Strong America.

Goldberg, H., Cairl, T., and Cunningham, T. J. (2018). Opportunities Lost. How Child Care Challenges Affect Georgia's Workforce and Economy. Research Report, geears.org.

Gurrentz, B. (2021). Child care subsidies and the labor force outcomes for working married mothers. Technical report, U.S. Census Bureau.

Heckman, J., Pinto, R., and Savelyev, P. (2013). Understanding the Mechanisms Through Which an Influential Early Childhood Program Boosted Adult Outcomes. *American Economic Review*, 103(6):2052–2086.

Heggeness, M. (2020). Estimating the immediate impact of the COVID-19 shock on parental attachment to the labor market and the double bind of mothers. *Review of Economics of the Household*, 18:1053–1078.

Ho, C. and Pavoni, N. (2020). Efficient child care subsidies. *American Economic Review*, 110(1):162–99.

Lipsey, M. W., Weiland, C., Yoshikawa, H., Wilson, S. J., and Hofer, K. G. (2015). The prekindergarten age cut-off regression-discontinuity design: Methodological issues and implications for application. *Educational Evaluation and Policy Analysis*, 37(3):296–313.

Montes, G. and Halterman, J. S. (2011). The impact of child care problems on employment: findings from a national survey of US parents. *Academic Pediatrics*, pages 80–87.

Moore, M. A., Boardman, A. E., and Vining, A. R. (2013). More appropriate discounting: the rate of social time preference and the value of the social discount rate. *Journal of Benefit-Cost Analysis*, 4:325–346.

Moschini, E. G. (2023). Childcare subsidies and child skill accumulation in oneand two-parent families. *American Economic Journal: Macroeconomics*, 15(1):475–516.

Reynolds, A. J., Temple, J. A., White, B. A. B., Ou, S.-R., and Robertson, D. L. (2011). Age 26 Cost-Benefit Analysis of the Child-Parent Center Early Education Program. *Child Development*, 82(1):379–404.

Ruppanner, L., Moller, S., and Sayer, L. (2019). Expensive childcare and short school days = Lower maternal employment and more time in childcare? Evidence from the American Time Use Survey. *Socius*, 5:1–14.

Saez, E. and Zucman, G. (2019). *The Triumph of Injustice*. W. W. Norton Company, New York, NY.

Semega, J. and Kollar, M. (2022). Income in the United States: 2021. U.S. Census Bureau, Current Population Reports, P60-276, U.S. Government Publishing Office, Washington, DC.

Talbert, E., Bustamente, A., Thompson, L., and Williams, M. (2018). Counting our Losses: The Hidden Cost to Marylanders of an Inadequate Child Care System. Monograph, Maryland Family Network.

van Huizen, T. and Plantenga, J. (2018). Do children benefit from universal early

childhood education and care? A meta-analysis of evidence from natural experiments. *Economics of Education Review*, 66:206– 222.

Work Institute (2017). Retention report: Trends, reasons, and recommendations. Report retrieved July 12 2019 from info.workinstitute.com/retentionreport17.

Yoshikawa, H., Weiland, C., and Brooks-Gunn, J. (2016). When does preschool matter? *Future of Children*, 26(2):21–35.